

REMARKS

In view of the following remarks, Applicant requests favorable reconsideration of the above-identified application.

Claims 1, 3, and 5-10 remain pending in this application, with Claim 1 being the sole independent claim. By this Amendment, Applicant has amended Claim 3.

Claim 3 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. In particular, the Office Action states that a recitation in Claim 3, pertaining to the diffusion coefficient of the material of the first grating being less than the diffusion coefficient of the material of the second grating, is not adequately supported by the specification as originally filed. Applicant traverses this rejection and submits that the discussed feature of Claim 3 is fully supported, for the reasons discussed below.

Paragraph [0007] of the specification states that aluminum has a low melting point and a high diffusion coefficient with respect to a quartz substrate. Paragraph [0009] states that the durability of the structure is increased by disposing, between an aluminum diffraction grating and the substrate, a metal or metallic compound having a small diffusion coefficient with respect to the substrate. As discussed in the specification at paragraphs [0036] and [0037], the metal or metallic compound may be titanium based. Thus, reading the specification as a whole, one of ordinary skill in the art would understand that aluminum has a high diffusion coefficient with respect to the substrate and titanium has a low diffusion coefficient with respect to the substrate, and thus the diffusion coefficient of titanium is less than the diffusion coefficient of aluminum.

Accordingly, Applicant requests withdrawal of the rejection under 35 U.S.C. § 112.

Claims 1, 3, and 6 stand rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 3,291,871 (Francis) in view of U.S. Patent No. 4,330,175 (Fujii, et al.). Claims 5 and 7 stand rejected under 35 U.S.C. § 103 as being unpatentable over Francis in view of Fujii, et al. and U.S. Patent No. 6,288,840 (Perkins, et al.). Claim 8 stands rejected under 35 U.S.C. § 103 as being unpatentable over Francis in view of Fujii, et al. Claim 9 stands rejected under 35 U.S.C. § 103 as being unpatentable over Francis in view of Fujii, et al. and U.S. Patent No. 6,813,077 (Borrelli, et al.). Claim 10 stands rejected under 35 U.S.C. § 103 as being unpatentable over Francis in view of Fujii, et al. and U.S. Patent No. 6,719,426 (Magarill, et al.). Applicant traverses these rejections.

As recited in independent Claim 1, Applicant's invention is directed to an optical element having a substrate, a first diffraction grating, and a second diffraction grating. The first diffraction grating is formed of titanium, or a compound thereof. That grating is disposed on the substrate and has a period that is shorter than a light wavelength used. The second diffraction grating is formed of aluminum. The aluminum grating is disposed on the first diffraction grating and also has a period that is shorter than the light wavelength used.

Francis is directed to a method of making plane-parallel fine wire grids which can be used as diffraction gratings or as polarizers. The formation of the wired grids involves electroplating metal on electrically conductive metal wires. The Office Action cites this document as allegedly describing all of the features of independent Claim 1, except for the use of titanium for the first diffraction grating. The Office Action cites Fujii, et al. as suggesting that the use of titanium is well known in the art of forming diffraction gratings. Specifically, the Office Action suggests that one of ordinary skill in the art could have

combined the use of titanium, as described in Fujii, et al., with the method of making gratings described in Francis.

Applicant respectfully disagrees with this position.

The fine wires 20 of Francis (which operate as diffraction gratings) are formed through an electroplating process. The fine wires 20 function as electrodes during the electroplating process. Applicant notes that it is difficult to use titanium as an electrode because of its sensitive reactivity. Specifically, when soaking titanium in an electroplating bath having acid, the titanium will oxidize, covering its surface with titanium oxide. Titanium oxide acts as an insulator, which would compromise the use of the wiring as an electrode in the electroplating process.

Moreover, the resistivity of titanium is about $70 \mu\Omega/\text{cm}$, which is higher than that of platinum ($10.5 \mu\Omega/\text{cm}$). At column 3, lines 47-69, Francis describes that metals of low resistivity are suitable for fine wires 20. Thus, Francis would appear to teach away from the use of titanium, a high-resistivity metal, as an electroplating material. This problem is exacerbated by the fact that, as the size of the fine wires 20 becomes thinner, the resistivity becomes higher.

Thus, Applicant submits that one of ordinary skill in the art would not be motivated to combine the material choice of titanium from Fujii, et al. with the process described in Francis, inasmuch as titanium would not be a suitable material for use in the electroplating process forming the diffraction grating of Francis.

Accordingly, Applicant submits that Francis and Fujii, et al., taken alone or in combination, fail to disclose or suggest at least the features of a first diffraction grating formed of titanium, or a compound thereof, disposed on a substrate and having a period


that is shorter than a light wavelength used, and a second diffraction grating which is formed of aluminum, disposed on the first diffraction grating and having a period that is shorter than the light wavelength used, as recited in independent Claim 1.

The remaining claims in the present application are dependent claims which depend from independent Claim 1, and thus are patentable over cited art for reasons noted above with respect to Claim 1. In addition, each recites features of the invention still further distinguishing it from the applied documents of record. Applicant requests favorable and independent consideration thereof.

For the foregoing reasons, Applicant requests withdrawal of the outstanding rejections under 35 U.S.C. §103, and allowance of this application.

This Amendment After Final Rejection is an earnest attempt to advance prosecution and is believed to clearly place this application in condition for allowance. At the very least, the changes presented herein reduce the number of issues on appeal. Applicant requests entry of this Amendment under 37 C.F.R. § 1.116.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our address given below.


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